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ABSTRACT

Individuals in 14 job categories at the Analytical Instrument Division of the Hewlett-Packard Corporation were observed and interviewed for six months to determine their reading practices at work and in leisure settings. The individuals ranged from a research chemist and a printed circuit designer, to a quality assurance inspector and a mechanical parts inspector. Findings indicated that reading in job tasks had some of the following qualities: (1) most reading is not from books, (2) rarely is the goal of reading to learn the gist of the material, (3) the anticipated benefits are seldom simplified to the level of information or entertainment, (4) reading activities rarely occur for long time periods, (5) self-awareness of reading is remarkably low, (6) improvement in reading is assumed to be necessary, and (7) reading is not one option for acquiring information. (The report includes case studies of each individual). (HOD)

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Reading Research

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Reading Competencies and Practices

Case Studies of Reading in a High Technology Corporation

Irwin Kirsch and John Guthrie

August 1982

Technical Report #2

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Contents

Page

I. Introduction 1

II. Current Activities

Case Studies 1

Classification of Uses and Materials 44

Overview of Reading in Occupational Settings 45

III. Six-Month Projection 49

IV. Current Level of Funds Expended 50

Appendix 51

I. Introduction

Information contained in this report covers the research activities undertaken between March and August, 1982. The primary focus of these activities has been collecting data regarding the reading practices of a sample of adults at work and in leisure settings. Individuals in 14 job categories at the Analytical Instrument Division of Hewlett-Packard were observed and interviewed regarding the range of printed materials they regularly engage in and the variety of uses these materials serve. Descriptions of these interactions will form the basis for the construction of classification systems for materials and uses to be used in the surveying of reading activities and the generation of reading profiles during the next reporting period.

II. Current Activities

1. Case Studies

A. Sample and Procedures. Jobs within Hewlett-Packard are classified into 7 categories that include: officials/managers; professionals; technicians; clerical; skilled; semi-skilled; and service. Employees occupying positions within these categories were initially made aware of the study through a brief announcement in the company newsletter. In responding to this

advertisement, a handful of employees holding professional positions volunteered to participate in the study. This was not too surprising since they have the most freedom in scheduling their work-time. However, in order to obtain a wider sampling of jobs, members of the research staff personally contacted individuals whose names were randomly selected from a list provided by Personnel. These individuals were given an explanation of the scope of the study, the nature of the data to be collected, and their role in it. Without exception, individuals contacted agreed to participate in the study at work and permission was granted by their supervisors.

To date, case studies have been completed on individuals in 14 jobs that run across 4 of the 7 occupational categories used at H/P. This distribution is shown here.

Job Title	Classification
Research Chemist	Professional
Production Scheduler	
Technical Writer	
Computer Program Supervisor	
Product Manager	
Printed Circuit Designer	Technician
Electronic Technician: Laboratory Automation Systems	

Job Title	Classification
Bench Technician	Technician
Numerical Control Machinist	Skilled
Quality Assurance Inspector	
Mechanical Parts Inspector	
Production	Semi-Skilled
Skill Specialist	
Fabrication Specialist	

Represented in these job categories are individuals having a wide range of educational backgrounds and job experience. Education among this sample ranged from a high school diploma or vocational training up through graduate degrees in business, education, as well as the physical sciences. These persons have worked in their various positions anywhere from 4 months to 20 years.

Persons working in these various occupations were observed over a period of time ranging from several days to 3 weeks. Usually each observation lasted from 2 to 3 hours. An effort was made to observe each individual in the morning, in the afternoon, and during different days of the work week. The observations included verbal interactions with the employees at

which time they provided clarification of a particular reading event as well as a description of their general job responsibilities and their relationship to other jobs within the company. After the series of observations was completed, each individual participated in a 1-2 hour structured interview. This provided an opportunity for obtaining information concerning leisure reading activities as well as clarification of questions stemming from field notes.

Since all individuals participating in this study worked in open space, it was possible to make observations on several persons holding any given job. In the summaries that follow, the overview and description of reading at work in many cases includes observations of several persons working in close proximity doing the same job. Information pertaining to leisure reading is based on interview data obtained from a single individual working in the position.

B. Summaries of Case Studies

1. Research Chemist

Overview

There are 25 research chemists in a group of 100 R&D personnel who work in team clusters. Their responsibility is for

new product development. To meet this responsibility, one research chemist estimates that 65% of his work day is spent doing bench work. This involves reading printouts and charts from analytical instruments. Approximately 35% of the day involves reading, writing, and attending meetings. Most job-related reading involves journals such as Analytical Chemistry, Chemical and Engineering News, Industrial Research and Development, Journal of Chromatagraph Science, and Journal of Liquid Chromatography. To assist in keeping up with this literature the individual receives a summary of abstracts from various journal sources that are sent through an internal library. He peruses these for relevancy and interest and may request copies of desired articles. He also has responsibility for writing research papers for presentation at professional meetings as well as publication in refereed and other journals. This latter type of publication involves subtle promotion of new product lines and frequently serves as a marketing tool.

Reading Materials and Uses

Work. Work reading is characterized by the fact that this individual has both the freedom and the responsibility to choose what he reads. Most of the reading this person engages in seems to be perceived as having both job and personal benefits. Work-related reading is dominated by journal articles

and books dealing with natural science and engineering. These materials are very technical in nature consisting of sections of connected prose either alone or in combination with tables and graphs. Interestingly, although each material has a dominant use, the reader reports multiple uses for material depending upon its immediate and longterm utility. For example, the reader might read an article superficially at first to become aware of new ideas, facts, and developments, and then file it away for later reading that involves studying its content and examining and judging the material for synthesis into a research report or answering an inquiry made from an internal or external source. Engineering texts are reported as being read to assist in the design and construction of a product as well as for the monitoring of internal operations. In contrast to this, other science materials are read primarily to become aware of ideas being put forth by competitors. This is frequently done, for example, through sources such as The American Laboratory Magazine. This source is read and analyzed for its propaganda content since it is a non-refereed journal. Other books, such as manuals or handbooks like The Handbook of Chemistry, are read primarily to satisfy an immediate information need that involves locating information which is often embedded in a larger amount of print.

In addition to journals and books, a significant amount of

daily reading involved dealing with diagrams/charts, business correspondence, and files or records. Perhaps most interesting is the use reported for business correspondence. Due to the nature of the field of gas and liquid chromatography, much scientific state-of-the-art information is communicated among researchers through written correspondence. Time is spent studying and learning this information as well as judging the quality of its content. At the present time, he uses the computer terminal to receive and send internal memos and reports that serve a regulatory function and also to keep abreast of changes in policies and procedures.

Leisure. Newspapers are read on a daily basis while most books and magazines are reportedly read less frequently. In this case, one or more times per week. Many topics in these media, such as local news, human interest, humor, sports, announcements, and stories about people, are read primarily as a means of passing time or diverting attention and as a source of information to be exchanged in conversation. Other topics such as national news, health, social problems, and psychology are read primarily to learn the gist of particular topics or stories. In some cases, this information is studied to increase knowledge or to help confirm a sense of self or others. The individual serves as a lecturer for Weight Watchers. In this role he is very conscious of health articles that could be in-

corporated into his lectures. He also studies and analyzes consumer advertising related to health/foods. Through this he tries to analyze "traps" set up for the consumer.

2. Production Scheduler

Overview

One of a team of schedulers who are responsible for managing the manufacture of parts and assemblies for several Hewlett-Packard products. This team is made up of 8 persons, each having frequent need for and access to a computer terminal. The job is divided into two parts: long range planning and day-to-day operations. General responsibilities involve issuing and altering work orders to maintain a steady work flow. This involved reading computer output in the form of reports which include a daily activity report, a sales forecast report (biweekly), reports from the field, reports from other divisions, and a weekly status report from the stockroom. Information contained in these reports is primarily in the form of tables containing truncated information and numbers referring to parts, assemblies, dates, work orders, priorities, etc. Making sense of this information requires a considerable amount of background knowledge which is obtained on the job. There is no formal training program for this position. Formal reports are

augmented by face to face communications with peers and other workers in other areas of the Hewlett-Packard division such as manufacturing and marketing. Half of each day seems to be spent talking with these various people to ensure proper work flow.

Reading Materials and Uses

Work. Materials read for work on a daily basis involved using computer printouts. Frequently these were supplemented with support materials such as schematics and product structures which the reader designed to depict the parts and assemblies in a hierarchical fashion to show their interrelationship in terms of the sequence in which they are assembled to make the final product. Use of these materials is primarily to monitor operations. Accomplishing this objective involves the search of materials to locate specific information in order to satisfy a particular need. Various strategies are employed to search and locate only the needed information while glancing over the other information. Other reading materials include memos that are searched for information such as changes in design of parts that go into the assemblies for which she has responsibilty.

Leisure. Local, national, and international news in newspapers and magazines are read primarily to become aware of

ideas, facts, and developments. These materials are also perceived as being useful in social interactions particulary in the workplace. Stories in magazines and books were read primarily to relax and provide a change in the daily routine. These stories also served to stimulate or excite the reader resulting in her receiving enjoyment from descriptions of characters or events. Business/economic topics in newspapers, magazines, and books were scanned to become aware of new ideas and developments. On some occasions these sources provided new sources that were judged to be important. These sources were later located and read to learn new information as a means of self-improvement and job advancement.

3. Technical Writer

Overview

The primary job task is to compose manuals for Hewlett-Packard products. Most recently this individual wrote the Gas Chromatagraph Users' Manual 5790A which is a 200 page manual for operators that includes an index of 400-500 items. He also composes professional articles for such magazines as American Laboratory which contain information on instrumentation in gas chromatography emphasizing Hewlett-Packard's progress in this field. After finishing this article he has undertaken the task

of writing a users' manual for the computer program which will accompany the HP 1000. Since this program is written in PASCAL, he must acquire the programming language for initiating his tasks. In addition, he will need to form several new computer programs that will assist in the development of indexes for this new manual. One of the characteristics of this employee is that he creates his own tools to assist with the task of writing manuals.

Reading Materials and Uses

Work. The reading tasks encountered by this person are extremely broad in scope and high in volume. In composing a manual on the terminal he is likely to have two or three sheets of information with tables and texts from the appropriate R&D section. His style is to examine these for several minutes, engage in a burst of writing for several minutes, and edit what has been written rather casually. He then reexamines a new section of the sheet. The composition of an index for the manual requires examining the manual page by page and line by line for any word or two-word phrase that may be valuable as an index item. He identifies words that users such as chemists or technicians in the field may be likely to use in addressing the manual. A frequent reading task entails the examination of computer programs that are designed to provide formatting for

text he composes. These programs may have been written by another individual and he rereads them adding modifications to make them readable for him. He then applies these programs to his text to assist with the creation of indexes. Another class of reading task includes the examination of commands that are used to send format information to the typesetters. The manuals he composes are typeset within H/P and all of the constraints on typography, paragraphing, line breaks, etc., are entered by the technical writer rather than a phototypesetter.

Leisure. Reading for leisure and reading for occupational pursuits are not easily distinguished in the case of individuals occupying the position of technical writer. For example, this person reads books of natural science daily from 30 to 60 minutes in order to maintain his information about the field. This information base is used in the writing process as well as providing a source of pleasurable increase in knowledge. Engineering and electrical books are also pursued for similar reasons. This person reads fiction on a daily basis for up to two hours for sheer pleasure and excitement. He edits the work for infelicities of language as he reads these materials. Science magazines are read on a daily basis for 30 to 60 minutes also, including such magazines as Science, Byte, Scientific American, and Consumers' Reports. Finally, brief documents are read relatively infrequently compared to the heavy volume of

other materials, although diagrams and charts are read on a daily basis for about 15 minutes as a guide for some of the writing activities of this person.

4. Computer Program Supervisor

Overview

The primary task of this individual is to supervise and participate in the writing of a computer program to analyze data generated by Gas Chromatagraph. For this project she has learned a new language, PASCAL. Previously, she wrote in ASSEMBLAR language for similar software products.

Work stations for computer programmers consist of two or three rectangular tables with a terminal, two or three open "working" manuals, a printout, three or four sheets of notepaper, a nearby PASCAL programming book, and about 25 to 50 large manuals. The working rhythm of these computer programmers consists of alternation between several phases of activity. One phase consists of reading a previous program, for the purpose of understanding its general operation. This may consume from 15 minutes to one hour and may occur from one to three times a day. Another phase of activity consists of using a computer program manual, written either for systems that are manufactured by H/P or purchased by them, for technical refer-

ence. In these cases a particular command or symbol is looked up and the reading event is terminated. A third phase of activity consists of entering a new program, that is, writing a program on the CRT. In this phase, the individual may look at a printout intermittently along with handwritten notes as the program is input. Following a 10 minute input phase the previously constructed material is edited for errors of logic, sequence, spelling and other foils. This editing is usually a one to three minute procedure.

Reading Materials and Uses

Work. Reading materials used at work may be placed into five distinct categories. First, manuals consist of large handbooks for the operation of systems that may be manufactured by H/P or purchased by them. These are composed by technical writers and describe the functioning of the software, i.e., computer programs, or the hardware, i.e., computers or Gas Chromatagraphs produced by H/P. A second category is computer programs which may appear on terminals or paper copy. Such programs may range from 14 pages and 510 lines to 96 pages, 4,022 lines or more. A third category is documentation of internal programs. This information consists of guidance for understanding the operation of a program which may include specification of symbols, syntactic or sequential requirements of

operations, and other notes to users. A fourth category of information was ERS/IRS which were directed toward future systems. These are documents that describe future systems, either hardware or software and may be developed by H/P. The fifth category is memoranda which may be provided for the entire H/P Avondale staff, the R&D division, or the computing team she supervises.

Within this job there are different uses for these types of materials. For the manuals this worker has two distinct functions, one of them was referred to as "referencing" and the other one was termed "technical." The reference use consisted of reading the manual to determine the general operation of a program, its objectives, sequences of operations, and primary subroutines and components. The second use which was referred to as technical consisted of searching within a manual for a particular piece of information or a symbol such as NAMR1 or $SPLC..., etc. Such information is likely to copied down for future use in program construction.

Computer programs were read for several different uses in this job. One of them consisted of attempt to get a general understanding of overall operations; the second consisted of reading to extract a particular symbol or sequence to be used in another program; and a third consisted of editing to detect errors that had been an accident of composition or overseen by

other programmers. The material for documentation of internal programs may be read in a general comprehensive sense if they are being used to integrate one program with another or in a technical information/retrieval sense if documentation is being used to modify an existing program. The ERS/IRS documents are used to keep abreast of general development within H/P, to serve as a basis for feedback to the originator of the document, or as a particular guideline to program specification depending upon the status of a project.

Leisure. Leisure reading consisted of local news which was read for distraction from the daily routine. Books were read in equal portions in the fields of psychology, religion and Bible, and sports and recreation. This person was particularly oriented to running. Magazine articles in the area of health and nutrition as well as recipes were read avidly for general information and as guidance to improved diet for higher performance in long distance running. Fictional stories are read from magazines for relaxation and from books to her children as a form of education, moral development, and entertainment.

5. Product Manager

Overview

Responsibilities in this marketing position consist of man-

aging the marketing of the Gas Chromatagraph 5880A, which ranks eighth in total revenue out of 20,000 products manufactured by Hewlett-Packard. These include informing the salesmen through newsletters about the features and unique qualifications of this product, pricing the different versions and manufacturing units at a level that is commensurate with the excellence of Hewlett-Packard equipment and attractive to the customer during a recessionary period. Based on prior sales and competitor prices, this person forecasts the number of pieces of equipment that the manufacturing department should be ordered to produce. He also interacts with others in the development of advertising material and manuals for operation of this product.

Reading Materials and Uses

Work. The reading requirements of this job consist of highly frequent reference to handbooks of information. These handbooks contain price lists, part lists, descriptions of equipment and features, and similar information for the competing products. During the course of a two hour period, he reports that he works on four to five projects for about 20 minutes each. Each project requires reference to from 3 to 20 different manuals or files in which specific information is searched and recorded. The fragments are then integrated into a message or decision about production or pricing. Science

magazines such as Industrial Research and Development or Analytical Chemistry are occasionally read primarily for the positioning, content, and visual appeal of advertisements that they contain. A computer terminal has recently been used for composing information to appear in newsletters for the sales force. A reading demand includes the editing of this material to be sure that is relatively free of jargon and accurate in content.

Leisure. Leisure reading includes local news in a community newspaper. The classified ads are frequently examined. An important type of leisure reading consists of the Bible which is read daily for about 15 minutes both to confirm his spiritual and moral beliefs and to serve as a basis for conversation with other individuals of his religious persuasion. The relatively low total volume of leisure reading for this individual is slightly supplemented by examination of legal documents which are currently valuable since he is in the process of purchasing a new home.

6. Printed Circuit Designer

Overview

There were five P.C. designers in addition to a supervisor in the section observed. The critical tasks in the job consist

of reading a schematic drawn by engineers that represents the printed circuit board. The designer enters the components, i.e., the resistors, integrators, etc., and their interconnections on a large flexible transparent board. The board is approximately four feet wide by three feet high and may consist of three layers of circuitry. It typically requires two to three weeks to complete one design for an experienced worker. Although the task apparently requires manual dexterity the supervisor says that this is minimal as a criterion for successful job performance. More important are qualities of adequate reading of schematics and planning the layout of the board. Most of the workers had at least several years experience which, according to the supervisor, assisted them with not only learning the symbols and their connections but how to organize the circuitry on the board and how to understand the schematics of particular engineers which usually require alteration and improvement as the board is being constructed.

Reading Materials and Uses

Work. The reading tasks of P.C. designers involves first examining a schematic for general apprehension of its constituents and their relationships. The engineer who drafted it is usually consulted on particular points of detail regarding the connections between components. As a board is being construct-

ed, the worker typically treats a section, from 10 to 20% of the total
tion is referred to a small (4 inch by 6 inch) piece of pa-
per that placed to the left of the board. The units are
pasted o he board with intermediate glances at this paper
which de ibes exactly which connections are to be made. Fol-
lowing t completion of a unit, comparison between the fi-
nished u and the engineer's specifications is made and the
relation p of the subunit to the total is appraised. On some
occasion manual may be referred to which describes conven-
tions or mits regarding the board such as distances between
componen tolerances, load sizes, and transistor capacities.

Leis Reading for leisure pursuits was sharply demar-
cated fr reading for necessities of work. Almost no reading
material ere used for both work and leisure purposes. The
local ne was read for relaxation and the stock market was
followed r particular interest in Hewlett-Packard invest-
ments. lth magazines were read to keep abreast of new
trends a to locate recipes and ingredients that contribute to
a genera eight loss campaign being conducted by this person.
Within m tines, reviews of TV and movies are read for relax-
ation, a ough this information was not used as a guide for
entertai t. Through work a printed circuit circular is
availabl hich is read to become aware of new ideas, facts,

and developments in the general area of technology to which this job contributes.

7. Electronic Technician: Laboratory Automation Systems

Overview

Individual holding this position has an associate's degree in electronics which is supplemented with inhouse training usually by electrical engineers on a particular computer system. These courses usually run from one to two weeks. At the completion the individual is expected to understand the operation of the system and be able to repair it. This position shares responsibilities between checking out and adjusting the computer hardware making up a given laboratory automation system prior to shipping to a customer, and doing benchwork on printed circuit boards associated with these systems. The benchwork on P.C. boards is split between new boards and repair boards that have failed in the field.

Reading Materials and Uses

Work. Materials engaged in at work to support these responsibilities range from brief documents that include forms, files, schematics, directions, and computer terminal screens to connected discourse in memos and letters to handbooks of infor-

mation for quick reference to technical manuals. Technical manuals are read less frequently than other materials. However, understanding information they contain is critical to successful job performance. This material is read whenever a new PC board or computer system is being worked on. These manuals generally contain but are not limited to the theory of operation of various printed circuit boards. The reader must not only comprehend the contents of this material, but also be able to apply the knowledge gained in various situations. Other manuals and handbooks are referred to on a more frequent basis, i.e., several times a week as a source for locating specific information to satisfy an immediate need. Frequently this involves using the index to help identify and locate information. Memos are received several times each week. They are carefully read and pertinent information is learned and remembered. Frequently these materials contain information about policy changes within H/P or procedural information concerning other divisions of Hewlett-Packard or outside companies.

Forms are the most frequently encountered reading material on the job. These diagrams contain drawings and numerical information relating to various electronic components and their associations. The schematics are referred to numerous times a day particularly when the individual is doing benchwork. They aid in diagnosing defective components. These charts are used

to locate specific information. However, in order to be able to search these for some specific piece of data, the individual must have considerable understanding of electronics in general and a specific understanding of the theory of operation of a specific board. Forms generally accompany each job. For example, every time a board is fixed or a part replaced, a form is completed that details the failure. In addition the individual must complete a performance report when checking out any computer system prior to shipping it to a customer. These forms seem to have a regulatory function for monitoring the flow of equipment. Once every three months the individual spends approximately one full day making a data tape containing performance report data. Another type of material that is read less frequently is directions. These are series of steps that the individual is supposed to follow when conducting an inspection testing for a particular system. For example, there are 28 steps to be followed when conducting incoming inspection tests on the 2621A and the 2621P computer systems. These steps contain connected words and phrases running anywhere from a simple sentence to a paragraph with over 100 words of connected discourse.

Leisure. With the exception of one magazine titled Support Update, leisure reading is not perceived as having any benefit for work. This particular magazine is referred to several

times each week. In some cases the magazine is used to locate specific information and at other times articles are read and studied to learn a body of information for self-improvement. Other leisure magazine reading is also science oriented in content and includes Smithsonian and Popular Electronics. In general, these sources are read as a means of relaxation and also secondarily to stay aware of new facts and ideas. The reader reports reading only science fiction and short stories when he has spare time. These are used to provide excitement and amusement from unusual characters, places, and events. Newspapers are read on a weekly basis for brief periods. Most frequently engaged topics within the newspaper are consumer and classified ads and TV listings, each of which is used to locate specific information. Other topics such as national and international news are scanned at a superficial level and are used primarily as a diversion from other activities. This type of information, that is, news information, is gotten from TV and radio listening.

8. Bench Technician

Overview

This is a skilled position that is held by persons already having an associate of arts degree in electronics or currently

working toward completion as part of an apprenticeship program. Individuals work at benches testing new P.C. boards as well as evaluating and repairing boards that have failed during final assembly checks or in the field. In general, technicians are responsible for a limited number of boards that are associated with particular instruments. Through repititions they become highly skilled at evaluating and repairing various boards. Occasionally, the individuals are cross-trained on other boards by appropriate technicians. This is done to reduce boredom and improve efficiency and productivity. Among the technicians observed, two participated in the interview part of this study. One of these individuals was recruited from an electronics school by H/P, while the other had just completed an internal apprenticeship program. She had started in H/P several years before as an assembler and was eventually selected for training and school. During the observation phase, they were in the process of cross-training each other.

Reading Materials and Uses

Work. Forms, schematics, files and records, directions and handbooks characterize the range of printed material normally read as part of the job. Forms included daily labor record, computer printout of work requirements that include P.C. board number, quantity, and due date; and tags on failed boards that

displayed identifying information and general description of the failure. These materials serve to fill an immediate information need and are searched to locate specific pieces of data.

Each board has a schematic diagram which is repeatedly referred to during the course of the day by the technician. These diagrams contain graphic symbols representing electronic components along with their interrelationships as well as numerical data referring to electrical measurements.

Associated with each schematic is a handbook of information which details the operational theory of the associated board and a printed set of directions detailing the test procedure for evaluating new boards. These materials are read and studied initially when the individual first begins working with a new board. Once learned, however, they are used only as a reference to locate specific information as problems or unfamiliar occurrences arise. These materials are heavily supplemented during the initial learning by other sources. Primary among these is the experienced technician explaining the nature of the board, its theory of operation, general procedures and testing, and common failures. In addition to verbal descriptions, there were also handwritten notes from persons who previously held the position. These pages contained an alphabetical list of common failures associated with the part and the

reason for the failure. This list was referred to several times during my observations and was added to by one technician, once.

Leisure reading--Case 1 . Leisure reading activity for this individual was dominated by the newspaper. Although he received the daily paper, most of his time was spent with the Sunday paper. Here the topics of most interest related to health, psychology, and business and economics. These were read to increase knowledge and understanding for self-improvement. Other topics such as local, national, and international news and sports were looked at primarily to stay abreast of recent developments and to provide information for conversation at work. With the exception of home maintenance and texts dealing with electronics needed for work, the individual reportedly does not engage in any book reading on a regular basis. Similary magazine reading was limited to work related topics, although he noted that he read these primarily for his own interest and information. He perceived them as being only indirectly beneficial to work. These included Science Digest, Popular Mechanics, and Popular Electronics. The reader noted that he would spend a few minutes going through each of these when they arrived with only occasionally spending any time reading an entire article.

Leisure reading--Case 2. Leisure reading activities were

restricted almost entirely to newspapers. Topics were primarily entertainment rather than news oriented. These included local news, prominent people, comics, TV and consumer advertising, which served primarily as a means of relaxation. Since this individual was completing her A.A. degree, she was enrolled in a political science course. Related reading was of a search nature. Rather than reading and studying the text, she would search for specific information to answer questions provided by the instructor, as homework. In addition, she would scan Consumer Reports and Ebony magazine on a monthly basis for general awareness of information contained in them. She reported rarely spending more than 15 minutes a month with each.

9. Numerical Control Machinist

Overview

This manufacturing postion requires skills and knowledge of machining including shop math as well as programming skills required to set up the NCM to machine a given part according to specifications. In addition to setting up (i.e., either entering an existing program or writing a new program) the machine for operators, this position also supervises other operators and machinists in other work areas. This requires taking responsibility to ensure the proper work flow, solving the daily

problems that arise, ordering parts and equipment and interfacing with higher management.

Reading Materials and Uses

Work. Reader spends approximately 3 hours each day engaged in various reading activities that include books, journals, brief documents and computer terminals. Books read for work consist primarily of texts dealing with engineering and basic programming. This material is read to become aware of new scientifc information to increase the reader's knowledge and to locate information that will help satisfy an immediate information need. Other books such as manuals or handbooks are read primarily to find specific information that is required to assemble or make something. Trade magazines and journals such as Commline, Trade Talk, and Tooling Digest are read less frequently being monthly publications. They serve primarily as a source for keeping abreast of new developments in the NCM field as well as a means for increasing the reader's knowledge. On occasion an article that is particularly relevant will be studied and specific information used. Another source of reading that is perceived as extremely important at work is business correspondence from outside vendors. These letters are read to stay abreast of information and to find specific information needed by the reader. Memos and ads in journals are read pri-

marily for keeping abreast and also to locate information although this use in not viewed as critical to the job.

Another area of work related reading materials involves schematics, forms and files. These are both computer-based and hard copy. Schematics are read daily as a part of the manufacturing process. Specific information is sought from these diagrams and used in conjunction with the NCM program to ensure manufacturing of parts to specifications. Jobs are selected from work orders and fabrication process sheets. These forms provide specific job and part related information that is used in the construction of material and the regulation of work flow. In addition to computer files, this supervisor keeps a folder of each job or part. Information that is frequently used from these files includes: the last time the job was run; time taken to set up the job; time taken to run the job; and the corresponding machine tape. Before setting up a job with a given machine tape, the individual checks the file to make sure the particular print corresponding with the part is not in the process of change.

Leisure. Leisure reading consists mainly of newspapers but also involves some magazine reading. Aside from work related reading or an occasional repair manual around the house or a sports book, the individual does not read fiction, historical, or scientific type books. Magazine reading is limited primar-

ily to sports and recreation. These reading materials serve as a means of keeping abreast of latest developments and finding information such as baseball standings or rule changes. In addition, this reading provides a source of excitement as well as a means of relaxation or distraction from daily events. Newspaper reading occurs daily with most time spent reading the local news. This topic provides the individual with information about events in his immediate environment and is a source for exchange of information in social situations. Most time is spent reading recreational articles or sections of the newspaper for specific information regarding a vacation. Business and economic news topics are read for self-knowledge and awareness. Particular attention was paid to stock listings in order to locate specific information. Editorials are read to help increase knowledge of a particular topic as well as a source of excitement.

10. Quality Assurance Inspector

Overview

Due to potential competition from international markets there is a push within H/P to increase quality control of all manufactured parts. This includes those parts done internally as well as those purchased from outside venders. To accomplish

this, H/P is in the process of putting together a QA team that will inspect all manufactured parts as well as train employees in the methods of statistical quality control. Several QA inspectors were observed, one of whom had worked in the position 4 months, one of whom was doing this as part of his machinist apprenticeship program and one of whom was a journeyman machinist on loan for 2 weeks to learn about QA. These individuals worked in a long rectangular room that was enclosed on two sides by glass. Along one side was a workbench, at which most inspections were done. In the middle of the room were cabinets filled with instruments used in making particle measurements. There were other QA machines placed around room. On wall opposite from workbenches there were two computer terminals. At the end of the room, there was a receiving belt where parts received by shipping department were sent for inspection and then on to the stockroom.

Reading Materials and Uses

Work. A variety of reading materials are used to support the examiniation of manufactured parts. First thing each morning, the individual goes to the computer terminal to request a listing of manufacturing jobs and their priorities. After selecting the top priority job, he obtains the parts along with a schematic containing engineering specifications. Different

parts require somewhat different procedures. For example, mechanical parts are carefully inspected and all dimensions are checked and measured against schematics. On some occasions calculations are done to determine tolerance limits. In some cases, as when surface texture is critical, electronic equipment is used to obtain measurements. He receives verbal instructions or procedures to use equipment. Other parts such as injected molded plastics are reviewed in other ways. For these, only dimensions which are marked by a black dot are seen as critical and measured for tolerance. Frequently there are inspection notes on schematics which specify procedures for conducting the inspection. Associated with visual inspection is a manual containing guidelines in the form of tables outlining acceptable defects. The inspector referred to this manual as the result of an inspection note which stated that the part must meet "Cosmetic standard for HP External Category 11A" which means this part is visible to customer. The reader felt that guidelines didn't provide enough information so he called an engineer with experience in molded plastics. This individual came and explained the process used to mold the plastic and that the surface marks observed were due to the process and could not be eliminated.

After each inspection job, information contained on the "Material Receiver" form is entered into the computer. These

forms coin information as to part number, vendor, quantity, date, inction notes, etc., that are used for internal control of ts and manufacturing. This information is also used to gener historical reports on particular parts. Individuals are ected to inspect at least seven sets of parts each day. Eainspection always begins with schematic and ends with inpng data into the computer file.

Leis Newspapers are read on a daily basis with any given topiengaged in for only a couple of minutes. The only exceptio this is sports which is reportedly read for approximat13 minutes each day. Similarly, sports magazines are read approximately 20 minutes each day. Other topics in magazi such as national, international, and business news are read s frequently perhaps only once or twice each month. Bver, over 20 minutes is spent reading at each time. Mo leisure reading time is spent reading historical books. Bing of this material was reported to occur several times a w for over one hour each time.

Topic uch as local, national, international, and business news in n papers are used to become aware and stay abreast of new ideas facts. These topics also serve the purpose of providing reader with information that is utilized during social in actions. Editorials are read to either confirm beliefs or in outside opinion on a topic. Sports, in addi-

tion to being read to keep abreast and interact socially, are read to increase knowledge as well as locate specific information that reader determines is useful to him in betting on games. Book reading is highlighted by reader's desire to increase knowledge of historical events and enjoyment he receives from descriptions of various persons or events.

11. Mechanical Parts Inspector

Overview

This is a newly created position that grew out of increased attention being paid to statistical quality control procedures. The individual holding this position was in the process of putting together informal training packages that could be used to introduce and/or familiarize other manufacturing persons with procedures and test equipment to be used in evaluating internally manufactured goods. The focus of this effort is to increase quality control during the production process by making skilled persons more aware of these procedures.

Reading Materials and Uses

Work. Much of the job reading currently involves looking at quality control reports. Some of these reports are in the form of examples in quality control textbooks. These reports

have numerical data in tabular and graphic form surrounded by some connected prose. Currently, these materials are being examined and judged as to their appropriateness to the H/P situation. In concert with these materials, time is spent looking over H/P files, both in hard copy and on the computer terminal. These files contain current data on jobs being processed as well as historical data on jobs. Information includes: date, quantity, time to run, errors, types of errors, etc. These files are read not only for specific information to address some information demand, but also for increased knowledge and understanding of the manufacturing process as well as to examine and judge the information for future decision making. Since all quality control inspection follows from schematics, these documents are also a frequently occurring reading material. These are read carefully for specific and often very detailed information such as particular tolerance on surface finish or size of an opening. This information is used to examine and evaluate manufactured parts. Memos and business correspondence are also read and filed. They provide the reader with specific information relating to his job as well as general information and knowledge about H/P operations, particularly changes that might be occurring.

Leisure. Newspaper reading is the primary leisure reading engaged in. Most topics including local, national and inter-

national news, business, social issues, recreation, comics, and ads are read on a daily basis. Other topics are reportedly read at least weekly with exception of sports which the reader says he hardly ever looks at. While magazines and journals account for negligible amount of leisure reading, books are engaged in on a very regular basis. Specifically, these involve psychology texts, business/economics books, as well as books on drama, poetry and theatre. These materials coincide with the reader's interest in theatre and his involvement in limited production of some plays and skits.

National and international news is read primarily to keep abreast of new happenings in the country and world. In contrast, topics such as local news and social issues are read generally as a source of information to be exchanged in conversation. Ads are read to locate information for a specific need and editorials are examined and evaluated in terms of author's point of view and the argument put forth.

Psychology texts are read to increase the reader's knowledge and understanding of human behavior. This use is perceived as means of self-improvement that the reader considers highly valuable and is in contrast to news read in the newspaper which, although it occurs more frequently, is perceived by the reader as being of only incidental consequence. Drama and poetry are read for sense of enjoyment from story as well as an

appreciation for the use of language and words.

12. Production 1

Overview

Persons observed in this position were either assembling or running test checks on the desk top 3390A analytic instrument. The work area consists of a row of benches with two benches facing each other. Running alongside the benches is an elongated conveyor containing several shelves that house the parts needed to assemble and inspect this instrument. The individuals work generally at their own pace, but have a monthly quota to meet. All individuals observed within this job title were either assembling or running quality control test checks on this instrument.

The person partcipating in the interview is somewhat unique to H/P in this study in that he was originally trained as an electronics technician and worked at H/P in that capacity before being demoted. The company had offered to allow him to continue on as a technician provided he go to evening school for retraining. He decided not to invest the time or energy into this. As a result he was shifted to a less skilled position where his salary has and will remain the same until others rated similarly to him catch up to what he is currently ma-

king. This individual had responsibility for running the pre-hot box check on the 3390A. This involved completing a series of 10 visual and electrical checks. He conducted evaluations on four of these instruments at one time.

Reading Materials and Uses

Work. Work related reading was quite restricted due to the narrow scope of his job. Reading consisted primarily of completing and signing a checklist as well as reading printed displays that resulted from the test runs. These outputs were in the form of numbers or graphic displays. Quick glances were all that were required to ensure that the output matched specifications. In addition the individual would complete a daily labor record which involved filling out a form documenting the work completed on any given day. This involved primarily filling in numerical codes which someone else then entered into computer file. Periodically the individual would read a memo or a newsletter relating to the internal changes and operations of Hewlett-Packard. On occasion, the individual reports spending some time studying schematics of a particular instrument. He says he does this because he likes to have a working understanding of various circuitry. However over several weeks time I never saw him refer to any of this information.

Leisure. Individual works on weekends as a keyboard musi-

cian. His outside reading seems to deal primarily with associated topics. These involve classified ads and trade magazines to stay abreast of prices, reading stories about other performers, and reading the entertainment section of the newspaper. He also reports reading various sections of the newspaper for general information that includes local, national, and business topics. These are read generally on a weekly basis. With the exception of an occasional reference or technical book, individual says he does not read books. On several occasions during the observations and during the interview the individual noted that he considered himself a poor reader and that he cannot remember what he reads. It was not out of the ordinary for him to read the same article three or four times to get some understanding of it. Interestingly, he notes that he doesn't seem to have trouble reading and comprehending material related to music. He attributes his difficulties at work and life in general to the fact that he is not a good reader and does not read very much.

13 & 14. Skill Specialist (Fabrication Specialist)

Overview

Individuals occupying this position are responsible for assembling finished parts. This is a highly repetitive process:

the invidual may do the same task hundreds of times in completing any given work order. Generally, individuals will complete an entire work order which can involve soldering, sandblasting, baking, or some other type of operation. The manufacturing process for a given part is stated on a manufacturing process sheet which depicts the operation required by the individual. This work is done in a partitioned area which contains a series of workbenches where the fabrication specialists sit alongside each other. There is a computer terminal at one end of the work area which is used by this group primarily to regulate the manufacturing process and update job history files. At the other end of the work area, heavy machinery is used to assist with fabrications operations.

Reading Materials and Uses (Case 1)

Work. Reading done at work is limited by the highly repetitive nature of the job. Much of this reading involves using a computer terminal which consists primarily of looking at work orders. These forms provide the reader with some indication of upcoming work load along with their priority. Also on the computer terminal are labor histories for the individual and the part. This permits the individual to see what the average times are for completing the specified part as well as any problems that have existed with manufacturing of this part. These

files are searched for specific information that frequently is embedded in large quantities of print. Information is used by the specialists to help monitor and regulate their work flow. Other reading on the job involves computer-generated form used to tag manufactured parts. Again this reading involves looking for specific information to satisfy a particular need. Occasionally when a new operation is undertaken individuals will read sets of directions either on a printed sheet or in an operations manual. For example, the individual was observed to look up directions on mixing a special glue for assembling a particular part he had not done before. He also referred to an operations manual to determine the procedure for disassembling and cleaning the sandblasting. Memos are frequently read job materials. Working on the second shift, this individual is frequently left with instructions about particular jobs to be done during the evening.

Leisure. There is a sharp distinction between job and leisure reading activities for this individual. With the exception of reference materials, materials and uses read for work do not seem to overlap with leisure reading activities. Books are read rather infrequently and consist mainly of science type texts or magazine articles relating to the individual's future career interest. Individual reports rarely reading any novels or fiction material. Even newspapers are read only on a weekly

basis which is in contrast to most persons who seem to report reading a newspaper daily. In terms of engaged time, the individual is attracted to national and international news, articles dealing with science, and classified ads. The classified ads are searched for specific information and also as a form of relaxation. Science articles are read primarily to stay abreast of new ideas and developments and as a means of increasing the individual's knowledge. National and international news serves as a means of staying abreast of latest developments and also as a source for social interactions.

Reading Materials and Uses (Case 2)

Work. Job reading for this individual is similar in terms of material and uses to that of the individual described in Case 1. The major difference lies in the frequency with which these materials are engaged. The individual described above in Case 1 held the informal position of shift supervisor. In this role, he had responsibilty for regulating work flow and ensuring job and personal history data were entered properly in addition to his responsibilty for assembling parts.

Leisure. Reading done for work was distinct from that done during non-work hours. Sports in the newspapers was the dominant topic read both in terms of frequency and amount of time spent. The reader used this content as a form of relaxation

and enjoyment. International news was read primarily to keep abreast of developments and to provide information to be exchanged in conversation. Other topics such as human interests and announcements were used as a source of social interaction. Magazine reading was limited to interest in body building. The reader reported scanning through magazines on a weekly basis to stay abreast of new ideas on this topic. Book reading was both dominated and limited to courses enrolled in at school. These involved psychology and history texts and were reportedly read to increase knowledge and to learn a body of information. Several hours were spent each week reading about these topics. In addition to acquiring knowledge, the psychology text provided a means for understanding and support of sense of self.

2. Classification of Uses and Materials

We continue to work on developing an organizational framework for the materials and uses making up the reading activities we have encountered in our case studies. At this time we have initial categories, but remain unsure of the most efficacious way in which to represent them. These tentative classifications will be refined and reported along with the procedures and criteria used in the next progress report.

3. Overview of Reading in Occupational Settings

There is a traditional view of reading that is held implicitly by a large majority of the public of social scientists and educational researchers. This particular mind set is ushered to the foreground when such questions are asked as: How much reading do Americans do? How well do high school graduates read? Before attempting to answer such questions, the notion of reading must be understood and a common meaning must be shared.

The conventional wisdom is that for questions of this nature reading is an activity people engage in for information or entertainment. A deliberate effort of attention is directed toward a book which typically contains prose or connected discourse. The reader will spend a substantial amount of time, from 15 minutes to one hour or so, reading this book from beginning to end. A substantial amount of speed is considered to be valuable, and slow reading is unpleasant for the person and possibly a sign of low ability. The reader remembers the gist of the book without either attempting or succeeding in grasping all of its detail. This reading is of considerable benefit, but it is one optional means toward information or entertainment which may be supplanted by mass media or personal communication, for all but the most avid devotees of fiction.

This may be a realistic perspective for certain types of

reading, such as enjoying a novel by the fireside or absorbing a best-selling paperback in a vacation resort. However, other forms of reading depart radically from this scenario. One form of reading is that which occurs in connection with occupational pursuits. Most people read in connection with their work. According to Sharon, the typical person reads 141 minutes per day in the occupational setting. This considerable amount of time is not squandered on trivia or light scintillation. It is rather riveted to vitally important documents.

Reading in most occupational settings is not reading in the traditional view. Its basic characteristics contradict our normal conceptions. Reading in job tasks seems to have the following qualities:

1. Most reading is not from books. The majority of reading activities occur from manuals, handbooks of information, schematics, magazine articles, tables and figures, business correspondence, legal documents, and directions or guidelines.

2. Rarely is the goal of reading to learn the gist. Rather, the more frequent objectives are to indentify facts, totally remember information, evaluate and revise a document, synthesize information from several documents, transform information into a new presentation, convey information through conversation with others, or gain an overview of operations or agreements.

3. The anticipated benefits are seldom simplified to the level of information or entertainment. Usually there are multiple goals for reading the same document, which may include learning its information, applying the information to new settings in the future, talking to others about the value of the information for other purposes, and learning it for the basis of future knowledge acquisition.

4. Reading activities rarely occur for long time periods. Rather than intervals of 15 to 60 minutes which may characterize reading in the traditional view, reading activities are measured in seconds or minutes less than five. People inspect a table to learn three or four symbols in a matter of moments and transfer those symbols elsewhere. People glance over a document for five minutes to make an evaluation and delegate it to another reader, and so on.

5. Self-awareness of reading is remarkably low. Most people believe they spend rather little time reading. An exception must be made for the zealots and college professors. The contents of reading, amount of time spent, and goals are not accessible to conscious verbalization. However, probing questions and behavioral self-report such as logs of activities bring forth descriptions of reading in a tidal wave of volume and a network of complex dimensions that are astonishing.

6. Improvement in reading is assumed to be necessary. Ra-

ther[illegible]n regarding reading as a static ability that is utilized[illegible]en needed, reading in occupational settings is assumed to undergo a continuous upgrading. Employees state that there are substantially new types of materials to be learned and that one learns how to read them more efficiently with practice. Accompanying occupationally related reading matter are specialized or technical vocabulary, textual or typographical structures, and knowledge systems. From people who assemble machines to research and development leaders, the statement is universal that one must learn how to read new materials all the time.

7. Reading is not one option for acquiring information. Rather it is an indispensible activity that is critically important. For the large majority of workers, there are written materials that must be comprehended continuously for occupational success. Of course, a particular piece of information in a certain document for a single job task may be acquired from another person by telephone, or through conversation. But an overwhelming majority of workers rate the process of gaining information from written materials as mandatory to maintain and improve their positions.

Because the traditional view of reading as an activity is unlikely to be appropriate for a substantial majority of the reading activities in occupational settings, the traditional

methods for assessing and improving reading abilities must be reexamined. For example, reading tests that are composed from [illegible] books or textbooks will probably be inappropriate for predicting success of literacy in job settings in which forms, manuals, and graphic displays are the prevailing form of reading materials. The improvement of reading as it occurs in high school programs, community colleges, or study skills courses has been tightly linked to the traditional view of reading activity. Consequently its transfer value for meeting the demands of written documents in occupational contexts is expected to be low. The educational programs for reading in occupational or societal settings must be based on a thorough understanding of what those activities are.

III. Six-Month Projection

The observation and interview phase of the research study focused on the reading practices of adults having various educational and occupational backgrounds. Data distilled from these activities will be used in generating initial lists and tentative categories of reading uses and materials that will capture the full range of reading activities engaged in by these persons.

It is expected that during the next reporting period we will develop more precise categories and subject them to a

field confirmation. This effort will be aided by ongoing reviews of extant literature. A working bibliography is contained in Appendix A of this report.

Through these data gathering and literature synthesis processes we expect to refine our classification systems and develop a set of procedures and criteria that will provide a basis for constructing a data gathering instrument. This instrument will be in the form of a reading activities survey that can be used to yield reliable and valid data pertaining to the reading practices of individuals, groups, or communities.

Plans are to field test this instrument and assess the reading activities of approximately 100 adults working full-time at Hewlett-Packard. Should the recession continue or worsen and H/P officials not grant access to this number of employees, a contingent plan will be developed and carried out with the approval of ARI.

IV. Levels of Funds Expended

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READING COMPETENCIES AND PRACTICES

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